

Title: Phylogenetic relationships within Turneraceae based on morphological characters with emphasis on seed micromorphology

Journal name: Plant Systematics and Evolution

Authors name: María Mercedes ARBO – Ana María GONZALEZ – Silvana Mabel SEDE

Affiliation:

M. M. Arbo – A. M. Gonzalez

Instituto de Botánica del Nordeste-CONICET – Facultad de Ciencias Agrarias, Universidad Nacional del Nordeste, Sargento Cabral 2131, CC 209, K3400CBR, Corrientes, Argentina

S. M. Sede

Instituto de Botánica Darwinion-CONICET, Labardén 200,

CC 22, B1642HYD San Isidro, Argentina

Affiliation of the corresponding author: Instituto de Botánica del Nordeste - Sargento Cabral 2131, CC 209, K3400CBR, Corrientes, Argentina

Email adress- corresponding author: arbo.mercedes45@gmail.com

Online Resource 2: Appendix 2

Caption: Characters and character states

Characters	States
0 Plant habit	Herb 0 ; not herb 1 ; vine 2
1 Tector hairs of stem and leaves, adaxial face	Simple unicellular 0 ; stellate 1 ; porrect-stellate 2 ; simple pluricellular 3 ; absent 4
2 Glandular hairs	Absent 0 ; capitate-estipitate 1 ; microcapitate 2 ; sessile-capitate 3 ; clavate 4 ; setiform 5
3 Glandular setiform emergencies	Absent 0 ; present 1
4 Stipules length	Up to 0.4 mm 0 ; 0.5–2 mm 1 ; 2.1–6 mm 2 ; length >6.1 mm 3
5 Stipules insertion	At both sides of leaf base 0 ; joint to foliar base or to the petiole 1
6 Leaf base	Not prominent 0 ; prominent and persistent 1
7 Petiole	Present 0 ; absent 1
8 Foliar nectaries location	Absent 0 ; on the petiole 1 ; at petiole-leaf blade joint 2 ; margin of leaf blade 3 ; abaxial side of leaf blade 4
9 Pubescence: leaves adaxial face	Pilose 0 ; glabrous 1
10 Leaf adaxial hairs average length	0.05–0.1 mm (50–100 µm) microhairs 0 ; 0.101(101 µm)–1mm 1 ; 1.1–2 mm 2
11 Leaf blade	Flat 0 ; revolute 1
12 Inflorescence	Cymose 0 ; solitary flower 1 ; racemose 2
13 Flower morphs (A: androecium; G: gynoecium)	1 morph: homostylous [A = G; G > A] 0 ; 2 morphs: heterostylous: long-styled and short-styled 1 ; 3 morphs: long-styled, short-styled and mid-styled [A = G] 2
14 Epiphyllous flowers	Absent 0 ; present 1
15 Peduncle	Free or barely joint at the base to the petiole 0 ; joint to the petiole up to the middle or more 1 ; absent 2
16 Prophylls width	Absent or rudimentary 0 ; 0.3–0.5 mm 1 ; 0.6–0.9 mm 2 ; 1–1.9 mm 3 ; 2–12 mm 4
17 Pedicel	Present 0 ; absent 1
18 Sepals connation	Free or almost 0 ; up to a quarter of their length 1 ; up to half of their length 2 ; more than half of their length 3
19 Calyx/perianth tube, # of veins	20 veins or more 0 ; 15 veins 1 ; 10 veins 2

20 Calyx tube base, external face	Pubescent 0 ; glabrous 1
21 Petals color	Pink 0 ; salmon 1 ; white or white-blue 2 ; ivory or creamy 3 ; yellow 4 ; yellow-orange 5 ; orange-red 6
22 Petal dark basal spot	Absent 0 ; present 1
23 Perianth appendices	Corona free, inserted between petals and stamens 0 ; corona fixed on perianth at the throat 1 ; ligule on petals 2 ; absent 3
24 Staminal filaments pubescence	Glabrous 0 ; pilose 1
25 Staminal filaments connation	Free 0 ; connate only at the adnate portion 1 ; connate above adnation in a slender annular structure 2 ; connate irregularly above adnation, at different heights 3
26 Staminal filaments length of adnation	Free or almost 0 ; external face adnate only at the base 1 ; margins broadly adnate to petal's claw 2 ; external face adnate 20–33% 3 ; adnate along the margins up to the throat 4
27 Stamen insertion	On sepals or calyx tube 0 ; between crown and ovary 1 ; between perianth tube and ovary 2 ; on perianth tube base 3
28 Nectar pockets	Absent 0 ; present 1
29 Stamens relative length	All stamens of same length in each flower 0 ; stamens of different length in each flower 1
30 Anthers insertion	Dorsifixed 0 ; basifixed 1
31 Anthers apex shape	Obtuse 0 ; acute or apiculate 1
32 Anthers apex pubescence	Glabrous 0 ; pilose 1
33 Position of floral parts in respect of the ovary	Hypogynous flower 0 ; perigynous flower 1
34 Ovary pubescence	Pilose all over 0 ; some hairs at the apex 1 ; totally glabrous 2
35 Placentation	Parietal 0 ; basal 1
36 Longitudinal rows of seeds	Several 0 ; one, on the middle vein of each valve 1
37 Ovules per placenta	16 or more 0 ; 4–15 1 ; 1–3 2
38 Gynoecium length	Shorter than the corolla 0 ; equal or longer than the corolla 1
39 Styles curvature	Incurved-divergent bases 0 ; excurved-connivent bases 1
40 Styles pubescence	Glabrous 0 ; pilose 1
41 Floral nectaries position	Sepals 0 ; perianth tube 1 ; staminal filaments 2 androgynophore base 3
42 Fruit exocarp	Smooth, minutely spotted or areolate 0 ; warted, granulate or tuberculate 1
43 Fruit	Naked 0 ; with withered perianth 1
44 Fruit shape	Spherical or ellipsoid, length-width ratio = 1–2:1 0 ; ovoid or oblong, ratio >2:1 1 ; linear, siliqua like, ratio >10:1 2
45 Mature fruit position	Upright 0 ; pendulous or inverted 1
46 Seed curvature lateral view	Curved 0 ; straight 1
47 Seed shape lateral view	Comma shaped: concave rapheal side, slendered at base 0 ; hemisphere shaped: straight rapheal side, not slendered at base 1 ; obovoid: straight/sigmoid rapheal side, slendered at base 2 ; subglobose, convex rapheal side 3 ; crescent shaped 4 ; spindle shaped 5
48 Rapheal side	Concave 0 ; straight 1 ; convex 2 ; sigmoid 3
49 Seed shape rapheal view	Obovoid 0 ; ellipsoid 1
50 Raphe chalazal end	Without 'proliferation' 0 ; with 'proliferation' 1
51 Hilum position	Next to the exostome rim 0 ; on the exostome, close to the base 1
52 Seed average length	1.50–2.19 mm 0 ; 2.20–2.99 mm 1 ; 3–4.90 mm 2
53 Seed average diameter	0.7–1 mm 0 ; 1.1–1.4 mm 1 ; 1.41–2.7 mm 2
54 Seed average length/width ratio	Up to 1.99 0 ; up to 2.50 1 ; 2.60–3.60 2
55 Seed coat (episperm)	Reticulate 0 ; striate-reticulate 1 ; striate 2 ; crested 3 ; foveolate 4
56 Seed coat design origin	Endotesta and exotegmen 0 ; exotesta 1
57 Endotesta	Several layers 0 ; one layer 1
58 Seed coat ridges prevalence	Longitudinal 0 ; longitudinal = transverse 1 ; none 2
59 Seed coat reticulate knots	Not prominent 0 ; prominent 1
60 Seed coat areoles visibility	Conspicuous 0 ; inconspicuous 1
61 Seed coat areoles	With two punctiform cavities 0 ; with one punctiform cavity 1 ; just concave, without punctiform cavity 2

62 Seed coat areoles average maximum surface in mm ²	Small: 0–0.01 0 ; medium: 0.02–0.029 1 ; large: 0.03–0.1 2
63 Seed length/areoles average maximum surface ratio	Low: 30–100 0 ; medium: 101–200 1 ; high: 201–1150 2
64 Seed width/areoles average maximum surface ratio	Low: 15–49 0 ; medium: 50–99 1 ; high: 100–450 2
65 Epidermal cells variability	Similar cells in ridges, areoles or depressions 0 ; different: large cells in ridges, small cells in areoles 1
66 Seed epidermal cells outer wall	Flat 0 ; convex, with domes 1 ; forming papillae 2
67 Papillae shape	Filiform: length/width ratio > 8:1; base < cell width 0 ; digitiform: length/width ratio < 5:1; base < cell width 1 ; mammiform: base = cell width 2 ; dome shaped: base = cell width 3
68 Filiform papillae length	Short: up to 0.090 mm 0 ; long: 0.100–0.280 mm 1
69 Seed coat stomata	Absent 0 ; present 1
70 Stomata disposition	Solitary 0 ; multiples 1
71 Epicuticular wax	Absent 0 ; present 1
72 Exostome shape	Hemisphere shaped 0 ; conical 1 ; parrot-beak shaped 2
73 Exostome length/diameter ratio	Length < diameter 0 ; length = diameter 1 ; length > diameter 2
74 Exostome upper edge	With a rim 0 ; without a rim 1 ; rim developed into an annular crest 2
75 Rim/exostome diameter ratio	Up to 1.7 0 ; 1.8–2.2 1 ; 2.3–2.7 2
76 Chalaza shape	Obtuse 0 ; pulvinate 1 ; conical 2
77 Chalaza outcropping	Absent 0 ; present 1
78 Chalaza base	Without constriction 0 ; with constriction 1
79 Chalaza surface	Not concave 0 ; concave 1
80 Chalaza surface orientation, lateral view	Apical 0 ; intermediate/oblique 1 ; rapheal/lateral 2
81 Aril cell type	Smooth 0 ; convex 1 ; papillose 2
82 Aril cell papillae	One papilla per cell 0 ; several papillae scattered in each cell 1 ; each cell with several papillae arranged in a line 2
83 Aril pubescence	Glabrous 0 ; pilose 1
84 Aril division	Entire 0 ; lobed: incisions < half length 1 ; lacinate: incisions > half length 2 ; divided in filaments almost to the base 3
85 Aril insertion	Hilar 0 ; rapheal 1
86 Aril color	White or whitish 0 ; reddish-orange 1
87 Aril seed covering	Unilateral: covering only the raphe, at times partially 0 ; bilateral: covering the raphe and seed sides 1 ; enveloping: covering the whole seed 2 ; not covering the seed at all 3
88 Aril/seed length ratio	Up to 0.5 0 ; 0.6–1 1 ; 1.1–1.9 2 ; >2 3
89 Chromosome base number	x = 7 0 ; x = 13 1 ; x = 5 2 ; x = 9 3
90 Petals degree of adnation	Free 0 ; adnate just at the base to calyx tube 1 ; adnate along 1/3–1/2 of the calyx tube 2 ; adnate up to throat of calyx tube 3